HUNGARIAN ARCHAEOLOGY
E-JOURNAL • 2026/1 – SPRING www.hungarianarchaeology.hu

"BEYOND MARBLE"
Archaeometric approaches to the study of Roman official portrait sculpture

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Hungarian Archaeology Vol. 15 (2026) Issue 1, pp. 1–10. https://doi.org/10.36338/ha.2026.1.1

This paper offers a concise overview of new approaches to the study of Roman official portrait sculpture, emerging from the integration of traditional art historical methods—primarily iconographic and typological analysis—with the results of modern archaeometric research. Earlier interpretations of these phenomena presented here were largely grounded in foundational studies that emphasized the socio-cultural and economic dimensions of imperial propaganda inherent in official art. In light of recent discoveries and the increasingly interdisciplinary character of archaeological methodology, these frameworks merit partial reconsideration. Material selection, shaped by both availability and social expectations, was embedded in imperial practices of self-representation as a carrier of meaning. Archaeometric data, therefore, do not merely supplement stylistic and typological interpretations, but represent a feedback that reshapes existing frameworks and places them in a new perspective.

Keywords: Roman official portrait sculpture; archaeometry; provenance analysis; marble trade; workshop practices

THE FACES OF IMPERIAL MARBLE USE

Marble, as a prestige material endowed with complex symbolic associations, became one of the defining material expressions of *Romanitas*. Owing to the early establishment of its socio-cultural background, as well as to an extensive trade network capable of overcoming geographical and environmental constraints, a wide range of marble types came to shape the visual character of official architectural and artistic projects across the Roman Empire by the Early Imperial period. At the same time, they played a crucial role in the self-representation of both imperial and provincial political and economic elites.

Within ancient moralising discourse, the use of marble was often criticised as an excessive and misguided fashion—an expression of what ancient authors themselves described as a form of "supreme moral madness." This critique is also echoed in Pliny the Elder's Natural History: "We quarry these mountains and haul them away for a mere whim; and yet there was a time when it seemed remarkable even to have succeeded in crossing them… ships are built specially for marble. And so over the waves of the sea, Nature's wildest element, mountain ranges are transported to and fro…" (Plin. *NH*, 36,1,1–2, transl. by D. E. Eichholz).

The large-scale use and circulation of marble, initiated with the conquest of the Greek East, gained new momentum under Augustus (27 BC–AD 14), whose deliberate architectural programme reshaped the city of Rome. As Suetonius famously remarks, he "found Rome a city of brick and left it a city of marble" (Suet. *Aug.* 28.3; transl. by J. C. Rolfe).

Modern scholarship estimates that between the early first century BC and the end of the Severan period (AD 193–235), the Romans quarried and used more marble than in any preceding period and in the following millennium combined (Russell 2013a, 352). This extraordinary demand – linked in the western provinces directly to Roman expansion and the spread of Roman cultural forms (Prochaska 2023, 401) – necessitated the exploitation of new sources. At the same time, the distinct physical and aesthetic properties of diverse varieties of marble led, to some degree, to goal-oriented selection: fine-grained, homogeneous white marbles were primarily used for sculpture, while coarser, veined, or coloured types were preferred for architectural purposes.

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Appreciative users did not choose decorative stones based solely on economic factors, even within the limits of availability. This is demonstrated not only by the surviving material evidence, but also, once again, by Pliny the Elder: "It is not important to mention the colours and species of marbles when they are so well known, nor is it easy to list them when they are so numerous. For there are few places for which a characteristic marble is not found to exist." (Plin. *NH*, 36,11,54; transl. by D. E. Eichholz).

As illustrated by maps of Roman quarry distribution (Russell 2013b) regions lacking local marble sources were indeed relatively rare. These regions may provide particularly valuable evidence for understanding the economic and social dynamics of marble trade, as well as its geographical, chronological, and cultural variations. The extent to which these processes were shaped by political representation is underscored by the fact that the city of Rome itself lacked local marble resources.

While in the central regions of the Empire a wide range of 'luxury' marble types was available in substantial quantities – owing to both local sources and extensive trade networks – other areas lacking marble outcrops and characterised by more limited economic resources, such as the frontier province of Pannonia, display a far more limited range and significantly lower quantities of these materials.

At the same time, current 'stone fashions' were not confined to imperial building programmes but were also adopted in private contexts, particularly in constructions of the provincial elite. As attested by the surviving stone monuments, the owners of *villa* estates in Pannonia likewise sought to employ a more varied and prestigious range of materials, extending beyond mere functionality, even if the acquisition of expensive long-distance imports met clear economic constraints.

Alongside locally or regionally available limestones and sandstones – used primarily for architectural purposes – different types of marble from the Eastern Alpine region, which could be obtained more efficiently in terms of both time and cost, became especially popular. A characteristic example is provided by Baláca (Hungary), where both sculptural and funerary monuments were produced from Gummern (Villach, Carinthia, Austria) and Pohorje marbles (Slovenia) (Müller 2001).

However, in contrast to more general trends within the Empire, the raw materials of sculptural and architectural fragments in Pannonia do not differ consistently, suggesting a close connection between the rare occurrence of more expensive and highly valued marbles from the Mediterranean and Asia Minor and official imperial representation. This observation may serve as a key criterion for interpretation: the use of Docimian marble (İscehisar, Türkiye) for the reworked over-life-size portrait heads from Aquincum[2] and Brigetio[3] thus strongly indicates imperial imagery (Borhy-Burucs 2024).

Reconstructing the use patterns of locally quarried and used materials, as well as those in the regional and supraregional circulation – requires systematic sampling and reproducible, integrated archaeometric analysis, including stable isotope analysis ($\delta^{13}C$ and $\delta^{18}O$), cathodoluminescence (CL) microscopy, and trace element composition analysis (Prochaska 2023), particularly in the case of white marbles. This necessity is rooted in the geological history of these stones: limestones subjected to similar metamorphic conditions may develop into marbles with highly comparable macroscopic and microscopic, mineralogical, and geochemical properties, even when originating from geographically distant regions, which can lead to significant overlap in their analytical signatures and thus limit the effectiveness of single-method approaches (Taelman, Delpino & Antonelli 2019; Al-Bashaireh 2021; Prochaska 2023).

This phenomenon is well illustrated by the high degree of similarity of the basic properties of the fine-grained Luna (Carrara, Italy) and Göktepe (Türkiye) marbles, both widely used in sculpture (Attanasio *et al.* 2015). Earlier interpretations did not yet have the chance to benefit from the application of archaeometric methods and often relegated the identification of marble types to the background or simply classified them as local or regional materials. As a result, Luna marble practically became a synonym for 'Italian marble' in scholarly literature (Attanasio, Bruno & Prochaska 2019, 178, n. 36). More recent systematic analyses, however, have in many cases revised the assumed Carrara origin of numerous official portraits,

[2] Recarved imperial marble portrait, Aquincumi Múzeum, Inv. no. AM 69.1.3; Lupa: 8372; LSA: 1054.

[3] Recarved imperial marble portrait, Komárno, Danube Region Museum, Fortification of Komárno, Bastion no. 6, Lapidary of Roman stone monuments; Inv. II-2790, Lupa: 4752.

often in favour of Göktepe marble (Attanasio Bruno & Prochaska 2019, 170, Cat. 17, 18, 24, 26, 28, 32, 37, 38, 42, 44–45, 47, 55, 72–73, 82, 84, 86, 88–89, 93, 96– 98, 102, 105, 107, 108, 112, 115, 119, 123, 144, 145, 188, 192, 193). Comparable results have emerged in the case of other marble types across the Empire – see, for example, the distinction between Paros 2 and Proconnesian marbles (Attanasio, Brilli & Bruno 2008, 748, 769) –, including works produced from Pentelic (Greece) and Docimian sources (Attanasio & Prochaska 2022; Al-Bashaireh 2021). As a well-known example, one may refer to the inserted monumental portrait head of Septimius Severus (AD 193–211), discovered in the Athenian Agora (*Stoa Basileios*).[4] Despite its distinctly Greek stylistic features, including surface treatment and the use of inlaid eyes, the marble is not Pentelic (from the vicinity of Athens) but Docimian, originating from the more distant quarries of İscehisar in Asia Minor (Attanasio, Bruno & Prochaska 2019, Cat. 2).

Portrait sculpture, requiring both high-quality raw material and considerable technical expertise, primarily served the imperial court and the higher eschelons of Roman society. Material selection was therefore shaped less by purely economic considerations than socio-cultural and aesthetic expectations, as well as technical preferences. A closer relationship than previously assumed may also be observed between the origin of the sculptor and the provenance of the marble. Sculptors appear to have favoured marbles from their native regions – which they likely used while learning to master their skills – or materials with similar physical properties (Attanasio Bruno & Prochaska 2019, 194; Russell 2013a, 230–232). This is clearly demonstrated by the well-documented connection between Asia Minor-based sculptors, including both local and itinerant masters, associated with the so-called Aphrodisian 'school' and the use of Göktepe marble. This connection can be established on the basis of signed works and further sculptures made of the same material and bearing with similar formal and technical traits (Long 2012, 190–192; Attanasio *et al.* 2015; Attanasio, *et al.* 2016; Attanasio, Bruno & Prochaska 2019, 193, 222).

Moreover, in connection with the rise of particular sculptural 'schools' and workshop centres, often supported by imperial patronage, certain marble types became especially sought after in specific periods (Attanasio, Bruno & Prochaska 2019, 170). An excellent example is again the Aphrodisian 'school,' which rose to prominence from the reign of Hadrianus (AD 117–138), notably through its participation in the architectural and sculptural project of the imperial villa at Tibur (Tivoli, Italy) (Van Voorhis 2018, 4–6).

This development is can also be traced through inscriptions found on marble blocks in quarries, which provide concise information regarding commissions, topographical data, exploitation and processing locations, and transport (Russell 2013, passim). As these inscriptions frequently mention responsible officials, including consuls, and are occasionally accompanied by lead seals bearing the portrait of the reigning emperor, they can in some cases be dated with remarkable precision, even to a specific year, thus helping define the approximate period when a specific quarry was in use. Contrary to earlier assumptions, however, such evidence does not necessarily point to a strict imperial monopoly (Russell 2013a, 45–49).

Determining the provenance of marble types not only enables one to reconstruct trade networks, but,within certain limits, also contributes to clarifying questions related to chronology, style, and typology of portrait studies (Attanasio, Bruno & Prochaska 2019, 168). In the following chapters of this study, two long-discussed portraits are presented as case studies that prove particularly revealing when considered in light of their material properties.

THE BRATISLAVA PORTRAIT OF CARACALLA (AD 198/212–217)

The slightly greater-than-life portrait head of emperor Caracalla[5], originally inserted into a full-length statue or bust (*Figs. 1 and 2*), were obtained by the Slovak National Museum from the former Pálffy collection. Its identification and typological classification have been clear from the outset. At the same time, however, its provenance and dating remained subject to debate due to the individual character of surface treatment

[4] Athens, Hellenic National Archaeological Museum, Inv. no. 3563; Arachne ID: 1106817, RIPD ID: 1540.

[5] *Caracalla*, so-called first „Alleinherrschertypus", Bratislava, Slovenské národné múzeum – Archeologické múzeum Bratislava, Inv. 642; Arachne ID: 1107308, RIPD ID: 1678.

Fig. 1. The Bratislava Caracalla portrait, frontal view. Slovak National Museum – Archaeological Museum, Bratislava, Inv. 642 (photo by Julianna Burucs)

Fig. 2. The Bratislava Caracalla portrait, right profile. Slovak National Museum – Archaeological Museum, Bratislava, Inv. 642. (photo by Julianna Burucs)

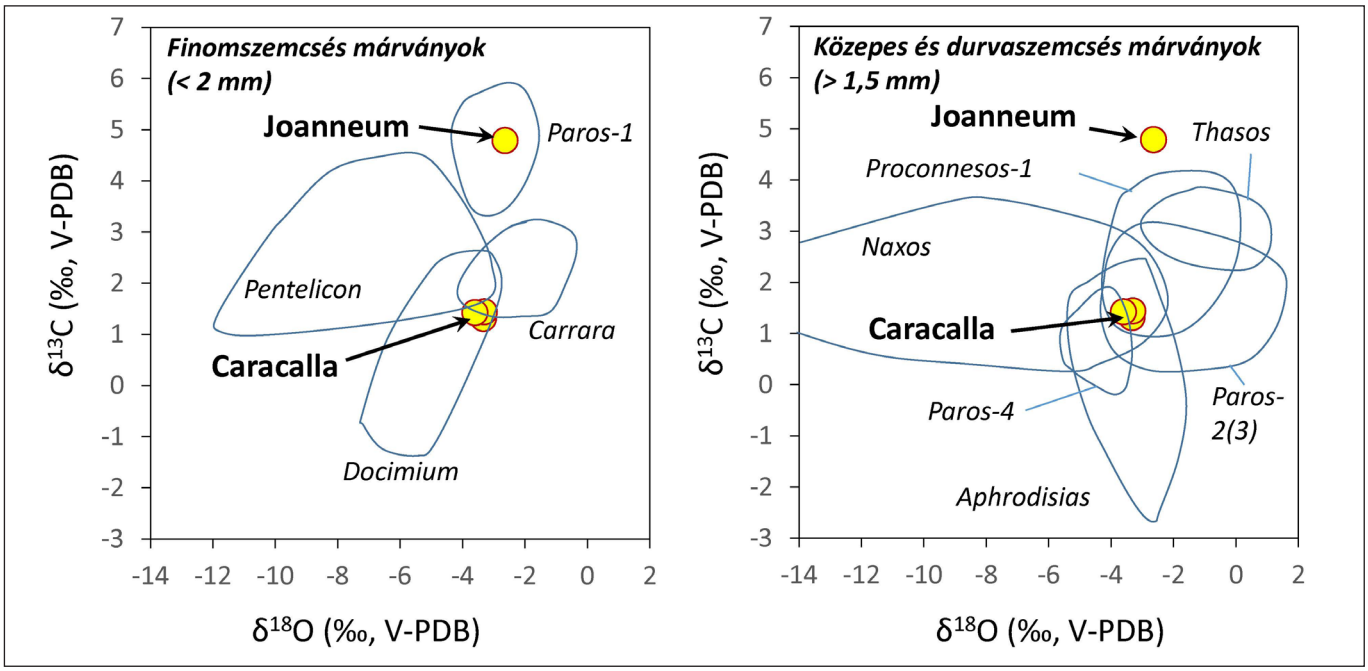

Fig. 3. Distribution of stable isotope ratios ($\delta^{13}C$, $\delta^{18}O$) of the Graz and Bratislava Caracalla portraits within the isotopic fields of ancient white marbles (by Attila Demény)

and its conspicuously different style from canonical replicas based on an official model defined at the imperial court and produced in central workshops in Rome.

Although Count János Pálffy (1664–1751) collected antiquities from the better part of Europe (Ciulisová 2006, 2018), scholars consistently identified the sculpture in focus as Italian and made from Luna marble. Macroscopic observations called this hypothesis into question. The medium-to-coarse grain visible along the longitudinal crack and recrystallized zone on the back of the head – associated with weathering – stands in clear contrast to the fine-grained, homogeneous character of *marmor lunensis*, the Carrara marble named after the town of Luni.

These observations also exclude both the repeatedly suggested possibility of reworking and a modern origin. On the one hand, the longitudinal crack cuts across the carefully carved pattern of the hair strands; on the other, recrystallization reflects a geological process that develops along inherent weaknesses in the marble fabric under the influence of humic acids in the soil. Such processes, involving the dissolution and reprecipitation of mineral components, cannot be artificially reproduced within a timespan of a few centuries (Margolis & Showers 1990, 297; Newman 1990, 266, 278).

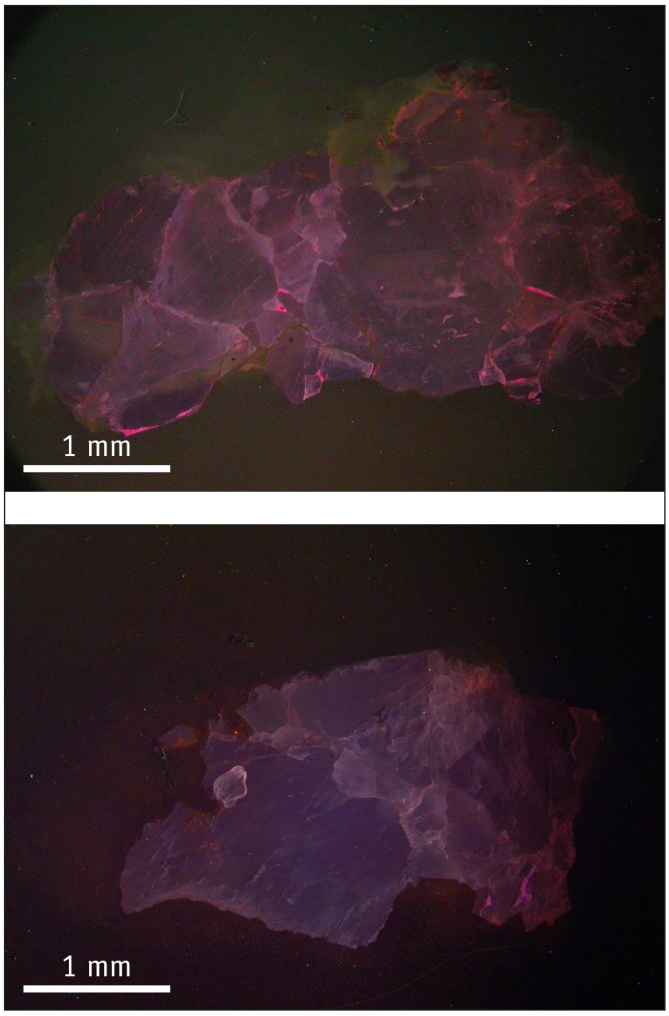

Fig. 4. Cathodoluminescence microscopie images of embedded samples from the Bratislava Caracalla portrait. Slovak National Museum – Archaeological Museum, Bratislava, Inv. 642 (photos by Bernadett Bajnóczi and Attila Demény)

These macroscopic observations made clear that further progress can be expected primarily from material analysis – which the results fully confirmed Evaluation based on maximum grain size and stable isotope measurements (*Fig. 3*) was complemented by cathodoluminescence analysis (*Fig. 4*); together, the results point to the material having been obtained from the city quarries of Aphrodisias (Türkiye).

From a chronological perspective, this provenance fits well within broader patterns of Severan-era marble use, as the proportion of marbles from Asia Minor increases from the mid-2nd century AD onwards and peaks under the reign of Caracalla (Attanasio, Bruno & Prochaska 2019, 207–212). This trend is clearly reflected in currently published archaeometric data obtained from portraits of Caracalla: among fifteen examined examples, predominantly from Rome and Italy, ten are carved from Göktepe marble and two (including the Bratislava portrait) from Aphrodisian marble, while only a single piece is associated with Luna marble (*Via Cassia*, 11th km, *villa* context). By contrast, alongside the single Luna marble example, only two portraits have been identified in the literature as being carved from 'local' materials. The colossal inserted portrait head from Philippi (Macedonia, Greece) has been attributed to a local workshop and its material was identified as dolomitic marble from Thasos (Saliara, Cape Vathy, Greece), while the material of another example was tentatively identified as Pentelic marble (from Mount Pentelikon in Attica, Greece). However, the analytical methods underlying the latter identifications remain unclear and were most likely obtained through stylistic and petrographic analyses; as such, they must be regarded as hypothetical. In other words, twelve out of fifteen portraits were produced from materials originating from Asia Minor (Attanasio, Bruno & Prochaska 2019, Catalogue; De Kersauson 1996, 386, no. 177; Scarpati 2020, 164; Burucs 2025).

The relationship outlined above between specific marble types and the origins of sculptors may also help explain the stylistic divergence of the Bratislava portrait from the Roman and Italian sculptural tradition. However, the characteristics of its form reflect a connection with the Greek artistic traditions of Asia Minor (Burucs 2025, 126–127).

Furthermore, the use of lower-quality material may also offer insight into the background and particulars of the commission: the portrait was likely not produced under official imperial patronage but on the order of a private individual belonging to a lower-ranking and less affluent stratum of the elite (Burucs 2025, 126).

At the same time, given the extensive circulation of marble across the Empire the precise context and location of the statue's original display cannot be determined, even when taking into account the relatively limited export of material from the city quarries of Aphrodisias (Long 2012, 190; Burucs 2025, 126–127).

A REWORKED PORTRAIT FROM GRAZ

The slightly over life-size marble portrait in the collection of the Joanneum in Graz (*Figs. 5 and 6*)[6] has been overshadowed by a series of contradictory interpretations. Information about its provenance remain disputed: most associated it with Flavia Solva (Wagna, Leibnitz, Austria) or a vineyard at Spielfeld (Austria) (Hudeczek 2008, 15), but more recent evidence suggests that it may be identical to a portrait head acquired by the Joanneum in 1819 from the amateur military officer Lajos Agyagfalvi Goró (1786–1843), who reportedly excavated it in Salona (Solin, Croatia) in December 1818 (Pochmarski & Porod 2022, 530). Its origin and find context however, cannot be determined with certainty anymore.

Its dating is equally problematic. Proposed datings range from a period preceding the reign of Gallienus (AD 253/260–268) (K. Fittschen, Arachne ID: 1067221), through the second half of the 3rd century AD (Bergmann 1977, 131, 214), to as late as the Tetrarchic period (AD 293–312/313) (Meischner 1986, 231–234; Pochmarski 2003, 121–122). Given the succession of twenty-four emperors between AD 235 and 284, such a broad chronological range clearly reflects an unusually high uncertainty, certainly arising from the sculpture having been reworked.

This intervention is not apparent at first glance; however, when examined under raking light, its traces become clearly visible in, both the treatment of the hair and the modelling of the physiognomy. Since the original design inevitably determines the appearance of the reworked sculpture (Bergmann & Zanker 1981, 318; Prusac 2011, 71–74, 96–101; Varner 2004, 10), the precise dating of such portraits is particularly difficult, and one must be exceptionally cautious when drawing conclusions regarding the place of the reworking in a broader iconographic and typological framework from the apparent stylistic features.

Technical aspects of execution and the overall character of the original sculpture – features that vary significantly across different phases of the Imperial period – fundamentally influence the features of the recarved piece as well. A voluminous, deeply drilled Antonine coiffure (AD 138–192), or the short hairstyles of the 'soldier emperors', closely following the cranial contour and defined by tightly structured, veristic features, can generally only be concealed without trace at the cost of substantial loss of material. Recarving, therefore – regardless of the economic, social, or political motivations behind it—also constitutes a compromise between phases, shaped by structural constraints as well as by the conditions imposed by the available material and the inherited formal repertoire.

Archaeometric analyses corroborated the reworking hypothesis. They revealed that, in contrast to earlier assumptions, the portrait was not made from fine-grained white marble from Italy (see most recently Hudeczek 2008, 15; Pochmarski & Porod 2022) but so-called *lychnites* (Paros 1 marble, Greece) (*Fig. 1*). This *par excellence* sculptural material was among the most highly valued marbles in the Early Imperial period, though its use gradually declined as the popularity of other varieties rose, and had become, by the Antonine period, closely connected with exceptional, high-status commissions.

'Quarry marks' associated with this material can be traced in quarries and on blocks recovered from

[6] Recarved marble portrait of a man, Graz, Universalmuseum Joanneum, Eggenberger Schlosspark, Inv.-Nr. 25192/Lap. Nr. 217; Arachne ID: 1067221; Lupa: 6102; LSA: 886. For a detailed analysis of the Graz portrait, see Burucs forthcoming."

Fig. 5. The Graz male portrait, frontal view – Provincial Roman Collection, Universalmuseum Joanneum, Inv. no. 25.192 (Lap. no. 217). (photo by Julianna Burucs)

Fig. 6. The Graz male portrait, left profile – Provincial Roman Collection, Universalmuseum Joanneum, Inv. no. 25.192 (Lap. no. 217). (photo by Julianna Burucs)

storage facilities (*statio marmorum*) established to accommodate the immense demand for marble and to rationalize its distribution. The youngest inscriptions date approximately to the mid-160s AD (Attanasio, Bruno & Prochaska 2019, 181–182, 204), thereby helping outline the upper chronological horizon for the original carving phase.

CONCLUSIONS

The phenomena outlined above, together with the presented identification of the materials official portraits from different contexts, demonstrate that traditional stylistic and typological approaches, when applied in isolation, often result in limited or biased interpretation. By expanding these interpretative frameworks, archaeometric analyses, when included in interpretation, not only nuance existing readings but, in some cases, also offer answers to long-standing questions through the correction of previously accepted data. Their significance thus extends well beyond a merely supplementary role. By revealing the decision-making processes underlying material selection, they contribute to a deeper understanding of the social dimensions of portraiture and the operation of the 'portrait system' (Fittschen 2010, 228–232; Niederhuber 2022, 3–4).

In terms of function, Roman official portraiture is above all a medium of representation, intended to convey a propagandistic ideal image of authority and, in private contexts, of status. As a status marker, the related choice of material—whether the result of deliberate selection or economic constraint—forms an integral and inseparable component of both its message and its socio-cultural context.

ACKNOWLEDGEMENTS

I sincerely thank Dr. Radoslav Čambal, Director of the Slovak National Museum – Archaeological Museum, Bratislava, and Mag. Karl Peitler, Head and Chief Curator of the Department of Archaeology & Coin Cabinet and the Coin Collection at the Universalmuseum Joanneum (Graz), for granting access to the portraits and permitting sampling for scientific analyses.

I am also indebted to Dr. Attila Demény, Director of the Institute for Geological and Geochemical Research, HUN-REN Research Centre for Astronomy and Earth Sciences, Budapest, and to Dr. Bernadett Bajnóczi, Senior Research Fellow at the same institute, for the archaeometric analyses.

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